The present investigation aimed at evaluating 26 genotypes to study the genetic and physiological basis of yield stability in rice. The genotypes were evaluated under four dates of sowings during kharif as well as rabi seasons. Thus the evaluation of genotypes at eight different environments permitted to identify stable genotypes analysed through Eberhart and Russell and AMMI models separately. The observations were recorded on 10 component traits including plot yield and 12 different physiological growth parameters to study the basis of yield stability in rice. The experimental materials possessed considerable amount of variability for all the traits except RLGR and LWR during kharif and rabi seasons respectively. Considerable amount of variability for majority of traits provided scope for genetic manipulation of characters in a desired direction. Selection on the basis of phenotypic value is effective for majority of traits except grain yield per plant, RLGR, RLAGR as there was little difference between PCV and GCV. A moderate to high heritability estimates were associated with high heritability gain for days to 50% flowering, plant height, panicle length, panicle number, grain number, 100-grain weight, grain yield per plant, plot yield, HI, RGR, CGR, NAR, LAI, LAR, SLA, SLW, RLAGR and PPTG indicated the presence of additive gene effect and therefore selection based on the basis of phenotypic performance would be effective. Both plot yield and grain yield per plant showed positive association with days to flowering, grain number, harvest index, LAI, LWR and negative association with fertility percentage, RGR and NAR. Further, the strong association between themselves revealed that selection on the basis of characters contributing to grain yield per plant also bears relevance to plot yield. On the basis of direct and indirect effects, the traits like fertile grain number, HI, panicle number, days to 50% flowering, fertility percentage, LAI, PPTG, RGR, NAR, PPCG and panicle length may be considered as important selection criteria for realization of high and stable yields in rice. During the present investigation grain yield was considered as the economic criterion and several quantitative and physiological growth parameters were chosen for the construction of fourteen selection indices. Promising genotypes like Konark, CR 749-20-2, Bhoi, Sebati, ORS 199-5, Lalat, Daya and IR 36 in mid-early group and Bhuban, Birupa, Gouri, Gajapati, Surendra, Vijetha, ORS 201-5 and Pratap in medium maturity group were selected on the basis of four selection criteria for their future use. The genotypes were classified into four groups based on regression coefficient and deviation from regression and genotypes like Sebati, Konark, IR 64 and ORS 199-5 were identified as varieties with above average stability. Similarly through AMMI analysis it was possible to identify Lalat showing good adaptation for normal sowing; Konark and Daya for late sowing and ORS 199-5 with good adaptation for both normal and late sowings in kharif season. Daya had shown very good adaptation both for normal and late sowing in rabi season. In medium maturity group, Bhuban, Gajapati and ORS 201-5 have shown good adaptation for normal sowing. Gouri and Birupa have good adaptation for late sowing in kharif season whereas, Gouri has exhibited good general adaptation for both normal and late sowings in rabi season. In general, it is revealed that higher yield, greater stability and better adaptation of different promising entries could be attributed to longer panicles, higher grain number with improved fertility, higher 100-grain weight, increased grain yield per plant, higher HI, increased RGR, CGR, NAR, LAI, RLGR, RLAGR, LAR SLA, LWR, SLW and PPCG and these traits may serve as selection criteria for prediction and realization of higher yield, greater stability and better adaptation in rice.